

Wm. Thomson Esq.

Tracts 1366

(1).

to the Successor of the late Professor of Medicine.
G. Hall.

A

MEDICO-LEGAL ESSAY

ON

INFANTICIDE,

TRANSLATED FROM THE AUTHOR'S

LATIN INAUGURAL DISSERTATION,

COMPOSED ON THAT SUBJECT, AND SUBMITTED TO THE FACULTY
OF MEDICINE IN EDINBURGH, PREPARATORY TO RECEIVING
THE DEGREE OF M.D. IN THE PRESENT YEAR.

By ROBERT ARROWSMITH, M.D.

PRESIDENT OF THE ROYAL MEDICAL SOCIETY OF EDINBURGH.

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TO

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IN THE UNIVERSITY OF EDINBURGH,

THE FOLLOWING

ESSAY

IS INSCRIBED,

AS A TRIBUTE OF RESPECT TO THEIR TALENTS,

LEARNING, AND URBANITY,

BY

THE AUTHOR.

TO

DAVID IRVING, LL.D.

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THE FOLLOWING PAGES ARE RESPECTFULLY DEDICATED,

BY HIS OBLIGED FRIEND,

THE AUTHOR.

ON INFANTICIDE.

IF the study of Medical Jurisprudence did not directly contribute to improve and elevate the character of the physician ; if it were not a study indispensably necessary to the correct exercise of his talents, on some of the most important subjects on which they can be engaged ; it would still commend itself to his favourable consideration, from the logical exercise which the details connected with it involve, from the firm proof on which its facts must repose, and the closeness of reasoning which its conclusions demand.

Constituting a branch of legal study, the facts and reasonings of Medical Jurisprudence, each receive their appropriate estimation ; and the latter emancipated from the *idola theatri*—the professional preconceptions and speculations of the physician, are submitted to the unbiassed logical process which is applied to every other department of legal testimony. The nature of the proceedings is an additional security also for accuracy of

observation and thought, for every fact and every opinion are subjected to the scrutiny of public and opposing criticism.

In the ordinary course of medical practice, both from the nature of the evidence, and from the imperfection of some of its principles, and perhaps also from the absence of a critical supervision on the part of others, probable conclusions, and for the most part of the loosest kind, are the only ones which the physician deems himself called on to form. He has so often failed to establish a certain regular consequence to signs which have preceded, that he gradually abandons the attempt, and thus he, who commenced his medical career a resolved and decided dogmatist, ultimately lapses into the indolence of empiricism. And he not only abandons the attempt where certainty was not attainable, but with that concession surrenders the hope of establishing conclusions, which close and discriminating observation, and a sound logic, would justly entitle him to entertain.

Nor is it in the details of medical practice alone that this lax application of logical principles is observable. The error exists in pathologic inquiries. Signs are observed during life, and dissection discloses appearances after death, and not unfrequently it happens that the former are attributed to the latter, without any attempt to establish or explain the supposed necessary connexion.

And if such be the fact, it is not surprising, that men are to be met with in the present day, who, captivated by the discoveries and speculations of Broussais, and the modern pathology of the spinal cord, deem the comparative silence of Morgagni on these points a sufficient reason for undervaluing the labours of that illustrious man, and who regard true pathologic science to have originated at the period, when it received its latest impulse, namely, in the writings of Corvisart.

Whilst I consider myself justified in these reflections with regard to much of medical practice, and to no inconsiderable part of pathologic inquiry, I believe a more favourable representation may be made of the state of investigation in forensic medicine, in which a more cautious and comprehensive mode of inquiry prevails ; for if that department of medical science has sprung into notice comparatively late, the progress of it has been such as to show, that the soundest principles have been engaged in it, and the student of forensic medicine may point to the reports of Chaussier and Foderè, as eminent examples of the correct application of philosophical principles to the object of his study.

But Medical Jurisprudence, in proportion to the strictness of its rules, and the delicacy of its inquiries, has to contend with difficulties ; and the ingenuity of crime, and the perplexing variety of

natural phenomena, present numerous embarrassments, some of which occasionally surpass the means of demonstration which it possesses. Nor is such an admission to be alleged against the utility of it as a branch of medical study ; for the very intricacy of its researches, and the clearness of proof which it demands, are, as it appears to me, highly important recommendations of it to the medical inquirer.

The subject of the following pages is one of those departments of forensic medicine, which has usually been supposed to be attended by its full proportion of fallacy and embarrassment. In selecting it for an academical exercise, it is not my intention to enter into a discussion of all the relations which it involves, but to confine myself to some of the more material points of medical evidence which are essentially connected with it. Nor do I enter upon it with any presumption that I shall be able to increase the stock of knowledge, or to remove existing doubts, but solely to inform my own mind on some points, concerning which medical opinions have been very fluctuating, and are not yet sufficiently fixed.

This mutability of opinion has arisen partly, perhaps, from the inadequate individual experience which practitioners (at least in this country) have had an opportunity of acquiring, and partly from

the prohibition, which our courts have imposed, on the quotation of published authorities. The latter circumstance, eminently calculated to discourage the literary study of medical jurisprudence, has not been, however, very constantly observed, and a little more firmness on the part of medical witnesses might effect its removal altogether. Thus we find on the trial of the celebrated Spencer Cowper, that one of the medical witnesses successfully resisted it. "It must be reading," said Dr Crell,¹ "as well as a man's own experience, that will make any one a physician; for without reading of books of that art, the art itself cannot be attained to. Nor do I see any reason why I should not quote the fathers of my profession, as you gentlemen of the long robe quote Coke on Littleton." But limited individual experience is an obstacle not likely to be removed; hence literary researches become doubly important; and fortunately for us, the investigations of the French and German medical jurists, combined with the modern modifications of the law, have placed us in circumstances more favourable, than those of our predecessors, for arriving at a clear opinion on many points of this inquiry; and there are now perhaps few questions in Medical Jurisprudence susceptible of clearer elucidation than Infanticide, as it is

¹ Howell's State Trials, xiii. 1163.

usually perpetrated in Britain. The early statutes against the crime of infanticide, were framed with peculiar reference to Bastardy, obviously from the high improbability of the crime being committed under circumstances of legitimate birth; and the guilt of the prisoner was supposed to be sufficiently established, if there was proof of the child having lived. The method of inquiry and proof was barbarous and palpably inefficient. We are told by Professor Bennett,¹ that in the Emperor Charles the 5th's "Criminal Police," it was merely directed that the breasts and parts of generation should be inspected by an experienced and sensible woman; and the delivery being, as it was supposed, ascertained, the proof of the death of the child at birth was imposed on the woman. "A mother," says Bohn,² "who, after concealed birth, was suspected of infanticide, which could not be proved, was put to the rack to extort confession." Beck,³ in a learned and judicious essay on infanticide, highly honourable to the medical literature of America, has given a comprehensive sketch of the state of legislation on this subject, in ancient and

¹ Geschichtliche Uebersicht, u. s. w. in Beobachtungen und Abhandlungen von österreichischen Aerzten. Dritter Band. Wien. 1823.

² Dissert. binæ de Partu Enecato, p. 336.

³ Elements of Medical Jurisprudence, by T. R. Beck. Second edition (by Dunlop). Lond. 1825. p. 189.

modern times, to which I beg leave to refer. The English law has of late years been materially changed. The statute of James 1st was enacted for the purpose of prevention,¹ an object wise in itself, but inadequately provided for by the enactment in question, which required, that any mother endeavouring to conceal the death of her (bastard) child, should prove at least by one witness, that the child was actually born dead ; a condition under certain circumstances obviously impossible, and therefore rendering the statute indiscriminating in its operation. ² This act continued in full force for 80 or 90 years, but at length it became customary to require some more positive proof of homicide. And by an act passed in the 43d of Geo. III. " it was provided that the trials in England and Ireland, of women charged with the murder of any issue of their bodies, male or female, which, being born alive, would by law be *bastard*, shall proceed and be governed by such and the like rules of evidence and presumption, as are by

¹ Perceval's Medical Ethics. Manchester. 1803. pp. 80, 85.
" This law, though humane in its principle, is much too severe in its construction. The statute which makes concealment of the birth of a bastard child full proof of murder, confounds all distinctions of innocence and guilt, as such concealment whenever practicable, would be the wish and act of every mother, virtuous or vicious, under the same unhappy predicament."

² Edin. Med. and Surgical Journal, 19, 451.

law used and allowed to take place in respect to other trials for murder ;” and thus the inquiry was brought more distinctly within the pale of medical evidence.

Infanticide has been divided into Prolicide,¹ or the destruction of the foetus whilst yet in the womb, commonly called criminal abortion ; and Infanticide, strictly so called, or the destruction of the child either newly born or in the course of parturition. The following Essay embraces the latter division only ; and the evidence respecting it naturally divides itself ; 1st, Into that which relates to the child, and 2dly, Into that which relates to the mother. The investigation of the following queries will embrace the most material points of medical evidence.

1. Was the child mature?
2. Was it born living or dead ?
3. What was the cause of its death ?
4. Has the suspected mother been recently delivered ?
5. Do the phenomena presented by the supposed mother and the child, establish the suspected relationship ?

I. Writers on Infanticide, on proceeding to the consideration of the first point in the in-

¹ Smith's Forensic Medicine.

quiry, have generally deemed it necessary to prefix a statement of the developement of the foetus at the different periods of utero-gestation, an examination which has been requisite from the obligation imposed on the prosecutor of proving the viability of the child. “ If it be discovered,” says Smith,¹ “ that the child has not reached the end of the seventh month of utero-gestation, the charge of murder must fall to the ground ; for although a foetus may come into the world alive previous to this period, experience has taught that it cannot continue to live.” “ Il faut,” says Capuron,² “ examiner encore si l’enfant est né à terme ou prematurement ; s’il est bien ou mal conformé, tant à l’extérieur qu’à l’intérieur. Car s’il n’est pas viable, s’il manque de quelques-uns des organes essentiels à la vie, sa mort peut bien n’être pas l’effet du crime.” If it be deficient in some of the organs *essential* to life, it will not of course present the signs of life ; but so long as criminal abortion is the subject of penal enactment, the destruction of a child born alive previous to the seventh month, and which continued, though but for a short period, to exercise the functions of life, would, I presume, in the eye of the law, be as truly an instance of Infanticide, as

¹ Forensic Medicine, p. 312.

² La Médecine Légale relative à l’art des Accouchemens. Par J. Capuron, &c. Paris, 1821, p. 337.

if it had been committed on a child perfectly viable, or at a later period; and the same remark may be extended to malformed children. Moreover, Dr Smith is in error in fixing on the end of the seventh month as the earliest period of the extra-uterine viability of the fœtus. Capuron¹ admits, that “des fœtus se développent quelquefois dans l’utérus avec tant d’énergie et de vitesse, qu’ à *six mois et demi*, ou sept mois, ils sont aussi viables ou aptes à vivre, que d’autres à huit ou à huit et demi.” And at p. 158, he quotes the instance of a child born at six months and a half, under his own observation, which continued to live. Not to mention the disputed case² of Dr Rodman, which is rendered more questionable by the example related by Mr Baker,³ in which the length and weight very closely corresponded with those of Dr Rodman’s case, there are several instances sufficiently well attested of birth and survival at six months, or six months and a half. Dr Merriman⁴ quotes one born at six months and 18 days, which survived. Two others are quoted in

¹ La Médecine Légale, &c. p. 182.

² Edinburgh Medical and Surgical Journal, ii. 455. There is no statement of the external signs presented by this child, which was an improper omission.

³ Trans. of the Med. and Physical Society of Calcutta, vol. ii.

⁴ Beck’s Elements of Medical Jurisprudence, Lond. 1825, p. 119.

the Edinburgh Medical and Surgical Journal,¹ the one born at six months and a half, and the other at six months. Belloc² also relates an instance of a decisive nature. The conclusion of Professor Christison is, "that at six months it is highly probable that it cannot live."³ But at whatever period a child can be born living, it may become, of course, the subject of Infanticide.

Smith⁴ says, that before the end of the fifth month no foetus can be born alive. And that, therefore, it is of the highest importance to inquire if we can verify the age of the foetus. Professor Monro has the same opinion.⁵ "Experience," says he, "has shown, that children born before the fifth month are not born alive." And hence it follows, that the anatomical characters of the foetus, from the termination of the 5th month, are principally interesting in this view.

Several anatomical descriptions of the progressive developement of the foetus in utero, are to be met with in medical writings. But the best general account with relation to Medical Jurisprudence, is

¹ Vol. xiii. 249, 526.

² Cours de Médecine Légale, Paris, 1811, 8vo. p. 78.

³ MS. notes of Dr Christison's Lectures. Dict. de Médecine. Oeuf Humaine. Par C. P. Olivier. "A six mois.. le foetus pourrait vivre alors quelques heures hors de l'uterus."

⁴ Forensic Medicine, p. 312.

⁵ Elements of Anatomy, 2. 615.

that which is contained in the Thesis of Lecieux,¹ published under the inspection of M. Chaussier.² This account has been copied, more or less exactly, by all subsequent writers on Infanticide, more particularly by Dr Hutchinson and Capuron, and by each with a careful concealment of the source of his information. To the details of Lecieux, Hutchinson has added the Osteological Observations of M. Beclard ; and these have been considered important, inasmuch as they are of a distinct character. I beg to say, however, that some preparations in the Museum of this University are at variance with the statements of Beclard, as to the period of commencing ossification in the different bones, but it is not easy to arrive at minute accuracy on this subject, as the exact period of conception is involved in the decision.

It will obviate the necessity of repeated reference, if a general acknowledgment be here made, that the following statement of the fœtal anatomy is compiled from the Thesis of Lecieux, *La Médecine Légale* of Capuron, the article *Oeuf Humaine*, par C. P. Olivier, in the *French Dictionnaire de Médecine*, and *die Anatomie und Bildungsgeschichte des Gehirns im Fœtus des Menschen*, u. s. w. von F. Tiedemann.

¹ *Considérations sur l'Infanticide*, Paris, 1819.

² *Recueil de Mémoires*, par M. Chaussier, Paris, 1824, p. 15.

At the end of the fifth month, the average length of the body is nine inches and a half ; the weight from nine to twelve ounces. The os pubis is no longer cartilaginous. The brain on the surface is smooth. On various parts of the pia mater, there are perceptible, but not very distinct, thin transparent patches, which are the rudiments of the arachnoid tunic. Several deep furrows and convolutions are now visible on the inner aspect of the hemispheres, where they are applied to the falx cerebri, which convolutions make corresponding elevations in the interior of the lateral ventricles. The septum lucidum arises by two very thin plates from the anterior pillars of the fornix, to be attached to the corpus callosum, thus leaving a free communication between the third and fifth ventricles. The fornix is now united to the posterior aspect of the corpus callosum, where its two portions also join each other. A deep fissure is observable between the corpus striatum and thalamus. The volume of the lungs is small, the heart voluminous, the ventricles little distinguishable from the auricles ; the liver very large, and near the navel, consisting of two equal lobes ; the gall bladder contains only a little almost colourless serous fluid ; the spleen little developed, and close to the stomach ; the meconium is in small quantity, and only occupies the cæcum and small portion of the colon. In the male fœtus, the testicles are

situated beneath the kidneys, near the lumbar vertebræ. In the female, the ovaries are small, soft, elongated, very distinguishable from, and in the same situation as, the testicles in the male.

At the sixth month, all the external parts are very distinct, but the pupil is said to be generally closed. The iris is said by Smith¹ to be at this time but imperfectly developed, whilst Capuron states that the eyes are properly formed. The head is large and soft, and the fontanelles much expanded. The skin is very fine, of a red or even purple colour, particularly in the palms of the hands, soles of the feet, face, lips, ears, and breast, in the folds of the groin, &c. The stomach is filled with mucus, a part of the large intestines with meconium. The testicles are still in the abdomen under the peritoneum. The bladder hard, pyriform, and without the pelvis, has but a small cavity. The scrotum is very small, and of a bright red. The vulva prominent, and the labia separated by the protrusion of the clitoris. The nails are either wanting, or are fine, short, soft, and reddish, and appear like a layer of epidermis. The average length of the body is about twelve inches, and the weight from one to two pounds. About this period, two points of ossification are formed in the second cervical vertebra, one situa-

¹ Forensic Medicine, p. 313. His account of the development of the fœtus is very vague and general.

ted above the other. Toward the seventh month, the superior point, which answers to the odontoid process, is larger than the inferior, which relates to the body of the bone. According to Tiedemann, the posterior lobes of the cerebrum now cover the corpora quadrigemina, and almost the whole cerebellum. The external or lateral walls of the lateral ventricles are considerably increased in thickness, much more so than the internal, and the ventricles themselves are very spacious and elevated above the corpus callosum. The three cornua are quite distinct. The choroid plexus is very voluminous. The laminæ of the septum lucidum are joined so as to form the fifth ventricle. The corpus callosum extends farther backwards, but does not yet cover the thalami and third ventricle. On the base the tuber annulare is much broader, consisting of transverse fibres, descending from the cerebellum, and uniting in the centre where the basilar artery makes a longitudinal furrow.

At the 7th month, the organs, both external and internal are more completely formed. The skin assumes a roseate tint, and is more dense and fibrous, and is covered with the "vernix caseosa cutis," unequally thick in different parts of the body. The pupillary membrane has disappeared. The hair of the head is longer, and of a deeper hue. The nails are firmer. The ventricles and

auricles of the heart are quite distinct ; the liver more distant from the navel, the bile yellowish and bitter. The meconium occupies the cæcum and all the large intestines. The testicles and ovaries are nearer the pelvis. The posterior lobes now cover, and extend beyond, the cerebellum, and several furrows and convolutions are observable on the surface. The corpus callosum covers the thalami, and consists of tranverse fibres, passing from one hemisphere to the other. The fornix is now complete, the two sides being united by a thin plate or layer of medullary matter, which corresponds with that portion named lyra. The corpora quadrigemina are divided by a transverse line or furrow, rendering them complete and distinct, the two superior, or nates, being a degree larger than the two inferior, or testes, and their parietes so thick, that the iter a tertio ad quartum ventriculum may be considered perfect. The cerebral nerves, relatively to the mass of the brain, are very large. The length of the body is about 14 inches, and the weight from two to three pounds.

At the 8th month, the skin becomes covered with very fine short hairs ; the skin itself is denser and whiter, and the nails firmer. The sebaceous covering is more apparent. Oftentimes the breasts are projecting, and a milky fluid may be expressed from them. In the male, the testicles are generally engaged in the abdominal ring ; and in the

female, the vagina and neck of the uterus are covered with a viscous and transparent mucus. About this period, the transverse processes have begun to ossify in the first lumbar vertebra. The structure and configuration of the interior parts of the brain, already completely formed, have only to be augmented in volume. The surface only has to be farther developed. The number of the leaflets of the cerebellum is not nearly so considerable as in the state of perfect developement. The two hemispheres of the cerebrum extend backwards considerably beyond the cerebellum. The hemispheres on each side are traversed with furrows, into which the folds of the pia mater enter, but these furrows, or the convolutions which they produce, are nowhere more marked than on the anterior and middle lobes. If the dura mater be detached from the superior surface of the brain, a layer more or less thick of soft substance remains adherent. If this be washed away by immersion in water, a multitude of flocculent prolongations remain, which are very delicate bloody vessels, presenting a velvety appearance. The length is about 16 inches, and the weight generally from three to four pounds.

At nine months the ossification is more complete. The descending ramus of the os pubis, and the ascending ramus of the ischium, are consolidated. The clavicle is 16 lines long, the cubitus

26, the femur 2 inches 8 lines. Ossification has commenced in the first cervical vertebra, and also in the first bone of the coccyx. The body of the fourth lumbar vertebra, which is the most voluminous, is three lines in depth, and six in breadth. The lateral portions of the six superior dorsal vertebræ begin to unite, so as to form a ring posteriorly to the bodies of these bones. The bones of the cranium, though movable, are in contact at their margins. Generally the testicles have passed the abdominal ring, or even descended into the scrotum. The nails are thicker and firmer, and are produced to the extremities of the fingers. Capuron pretends that the grey matter is now visible in the brain, but Tiedemann remarks, that at no period is it possible in the fœtus to distinguish between the cortical and medullary substance.

Although it cannot be pretended that the preceding detail of the developement of the fœtus, at the various periods of utero-gestation, is rigidly exact, (if we except the contributions of Tiedemann,) it will nevertheless furnish a tolerably safe ground for approximation ; and more particularly so, if taken in conjunction with M. Chaussier's criteria, drawn from the relation of the umbilicus to the centre of the body. It is stated in M. Lecieux's Thesis, that in proportion as the fœtus is remote from the period of birth, the extremities,

particularly the abdominal, are relatively shorter. In a well-formed adult, he says, the centre of the whole length corresponds to the superior edge of the pubes. But in the foetus the centre varies according to its age. At the full period of utero-gestation it corresponds with the umbilicus, or a little above it. At the 8th month, it is two or three centimetres higher; at the 7th, still nearer the sternum; and at the 6th, to the abdominal extremity of that bone. These conclusions seem entitled to every confidence, both from the character of the observer, and from¹ the great number of examinations on which they are founded. And as M. Chaussier² avows that Thesis so late as 1824, without altering any of the opinions contained in it, it may be inferred, that his later experience accords with his former conclusions. It would have been satisfactory to have received from Professor Bernt a confirmation of M. Chaussier's accuracy, but unfortunately he nowhere notices any of the works of the French professor.

The silence of Professor Bernt with regard to M. Chaussier, is the more surprising, that in the same volume in which his "Geschichtliche Uebersicht" appeared, the work containing Lecieux's

¹ M. Olivier says, that they were founded "d'après l'examen de plus de quinze mille sujets."—Dict. de Méd. Oeuf Humaine.

² Recueil de Mémoires, p. 14.

Thesis, was quoted by Professor Lenhossék, in a case of “*Erweichung und Zerreissung des Mangengrundes*,” p. 339, and in immediate connexion with Bernt’s *Beiträge*, u. s. w.

With respect to the weight and length of children, (as indications of foetal maturity,) they are liable to much variation, and very general conclusions only can be drawn from them. The average of various countries appears to differ; that of America being probably somewhat the highest, which may be attributable to the state of society with respect to occupation. In France, from¹ the observations of M. Camus, confirmed by Chaussier, the average weight is stated at $6\frac{1}{4}$ pounds. In England, according to Dr Macauley’s² observations, the most frequent range was from five to eight pounds. The estimate of Dr Joseph Clarke³ makes the average of males 7 pounds, 5 ounces, and 7 drachms; of females, 6 pounds, 11 ounces, and 6 drachms. In Dr Clarke’s experiments, the children were weighed in their clothes, and the *conjectured* weight of their clothes deducted. About 80 experiments were made by him. and 113 by Roederer—so that in number they are trifling in comparison with those of Ca-

¹ Lecieux, p. 9.

² Hunter’s *Anatomy of the Gravid Uterus*, London, 4to. 1794, p. 68.

³ *Ph. Trans. Lond.* vol. lxxvi. p. 349.

mus, Chaussier, and Macauley. In Germany, we are informed by Roederer,¹ the average ranged from 6 to 8 pounds. Dr Willoughby² states the average in America at upwards of 7 pounds. The extremes, according to Dr Macauley,³ were 4 and 11 pounds. According to Camus,⁴ from 2 to 10, and some 3 to 9 pounds. Dr Merriman delivered one of 14 pounds, and Dr Croft one of 15^{*} pounds. Baudelocque⁵ states the highest weight at 13 pounds, of which he had seen only one instance. Capuron⁶ has seen two only where they have weighed 12 pounds, and at the Maternité the highest weight was 10 $\frac{1}{2}$ pounds.

Lecieux⁷ remarks that the length of children at the full period is less liable to variation than the weight, an observation confirmed by Bernt. The following is a transcript of Lecieux's table:—

| " Month. | Millimetres. | | Inches. <i>French</i> . ⁸ |
|----------|--------------|---|--------------------------------------|
| 5 | 255 | = | 9 $\frac{1}{2}$ |
| 6 | 325 | = | 12 |
| 7 | 380 | = | 14 |
| 8 | 440 | = | 16 |
| 9 | 488 | = | 18" |

¹ Vide, for his Tables, *Opuscula Medica*, 4to, Gottingen, 1762, p. 34. ² Beck, p. 117. ³ Hunter's *Gravid Uterus*, l. c.

⁴ Lecieux, l. c. ⁵ *Art des Accouchemens*, tom. i. p. 220.

⁶ Capuron. p. 172.

⁷ Pp. 11, 12.

⁸ The French inch is to the English, as 16 : 15 .

And he finally agrees with Baudelocque in stating the extremes at from 16 to 22, or 23 inches of the old measure. Hutchinson¹ has probably erred, in his transcript of the extremes from Lecieux and Baudelocque, in not attending to the difference between the old and new French measures. Petit² assigns 21 inches as the usual length : and Roederer and Bose very nearly coincide with him. The latter, however, had met with two instances of 24 inches each.² “Hos ultimos autem,” says he, “a rusticis matribus progenitos fuisse.”

II. Having ascertained that the child had a structure fitted for life, the next question to be decided is—Was it born alive?

At the time when concealment of birth and evidence of the life of the child were held to be decisive of the commission of infanticide, this inquiry was of paramount importance : and indeed it is still one of high interest ; for if the negative evidence on this point be established, the charge of infanticide must be necessarily abandoned. It is of much importance, in cases of infanticide by omission, and in some instances by commission,

¹ P. 15.

² Collectio Opusculorum Selectorum, &c. Curante Dre J. C. T. Schlegel, vol. iii. p. 24.

as by various gases, &c. In civil suits, very important decisions are determined occasionally by this evidence; but if the recent suggestions¹ of M. Chaussier were adopted, all difficulties as to the life of the child, in a political sense, would be at an end.

The proofs of the survival of the child after delivery, must be drawn from the phenomena of respiration and circulation, as it is chiefly by the performance of the former, and the changes which take place with respect to the latter, that the commencement and continuance of extra-uterine life are indicated. Of the difficulties attending the solution of the question now before us by the methods long confided in, we may conjecture, from the almost interminable controversies connected with them, the history of which has been collected by Daniel² and Bernt³; and also by what is

¹ In his late essay, *Mémoire Médico-légal Sur la Viabilité de l'enfant naissant*, Paris, 1826, addressed to the French minister, he suggests as Art. v. "Est reconnu et déclaré viable, apte a jouir des privileges de la société, l'enfant dont la tête est bien conformée, qui, au plus tôt, 36 heures après sa naissance, est présenté vivant et vigoureux à l'officier de l'état civil, qui l'inscrit aussitôt sur ses registres, avec les prénoms qu'on lui donne, et les qualités des parens et des personnes qui le lui présentent." P. 30.

² *Commentatio de Infantum nuper natorum Umbilico et Pulmonibus*. Hallae, 1780.

³ *Geschichtliche Uebersicht der bisherigen Verhandlungen*

stated by Czermark, a pupil of the latter. He says,¹ “anno 1821 quatuor continuis vicibus accidit, ut summe devenerandus præceptor meus ac Professor Medicinæ Publicæ in Universitate Vindobonensi, e pulmonibus imam aquam petentibus et e docimasia hucusque usitata, assereret, natos quatuor examini medico-legali subjectos, ante partum expirasse, cum interea ex inquisitione forensi luce clarius pateret, eosdem vivos in lucem editos fuisse, imo aliquot horas vixisse.” It is fortunate, however, that errors arising from this source lean to the side of mercy; but it is still more so, that proof of adequate injury is now required to establish the charge of infanticide.²

Professor Bernt, who is the latest and most elaborate author on the subject, has divided the tests indicative of the extra-uterine life into three parts :
³ 1. Docimasia respirationis. 2. D. Circuitus sanguinis. 3. D. Digestionis et Excretionum. His Historical Researches he has arranged under the following heads: 1. Colour of the Lungs. 2.

über die Beweiskraft, sowohl als die Truglichkeit, der Lungenprobe, in Beobachtungen und Abhandlungen von oesterreichischen Aerzten. 3er Band. Wien. 1823.

¹ Experimentorum Docim. Pulm. Hydrost. illustrantium Centuria 1. curante Jos. Bernt, M.D. &c. Viennæ, 1823. Prolegomena, p. 5.

² Capuron, p. 428.

³ Exp. Docim. Cent. &c. p. 6.

Consistence. 3. Sp. Gravity. 4. Absolute weight. 5. Volume. 6. Emptiness, or otherwise, of the urinary bladder and bowels, and the existence or otherwise of ecchymosis. From his own experimental inquiries he has added, 7. Position of the Foramen Ovale. 8. State of the venous duct and umbilical vessels; and 9. The contraction of the canalis arteriosus, and the relation of it to the pulmonary artery and its two great branches.

1st, Before the year 1679, medical men, according to Budæus,¹ were not consulted in cases of Infanticide, and when they came to be so, their judgment at first rested on the absence of the ligature of the umbilical cord, and the presence of wounds about the head. Not, however, that other evidence was not then to be obtained, for Galen had pointed out the difference with respect to colour and density of the lungs, which had respired, and those which had not. Harvey, in 1651, first proposed these altered conditions as a test of extra-uterine life; and in 1682, Schrager actually employed them in medico-legal inquiry. In 1676,² T. Willis, whilst he concurred in the opinion of Galen, as to the change of colour in the lungs from respiration, asserted that the same change followed artificial inflation, and thus started the first

¹ Daniel, p. 92.

² Bernt's Geschichtliche Uebersicht, u. s. w. p. 4.

source of fallacy to the colour as a medico-legal test. Ploucquet and Olberg confirm the statement of Willis; and in 1758, Haller added a second source of fallacy, by maintaining that the colour may be changed by putrefaction. ¹ Schmidt made the colour of the lungs the subject of particular observation; and the conclusion he drew was, that of all the signs of respiration, it was the most variable and uncertain; and in this opinion Bernt, from his own experiments, partly coincides. ² From his experiments, it appears that artificial respiration in a dead child, if it change the colour at all, causes a pale or greyish red tint, (as Büttner and Hartmann had previously affirmed,) and that the only tint characteristic of natural respiration is scarlet red, but it is not always present. When it is, it affords strong presumption of natural respiration; and the evidence is still stronger, if, while the lungs are here and there scarlet, portions of them retain their foetal density and colour. The learned reviewer of Bernt, in the *Journal* just referred to, says, that he can conceive but of one objection, and that not of much importance, namely, if the heart pulsates during artificial inflation, the lungs will become scarlet, because blood is

¹ *Neue Versuche und Erfahrungen über die Ploucquet'sche und hydrost. Lungenprobe.* Wien. 1806. p. 240.

² *Edinburgh Med. and Surg. Journal*, 26. 367.

propelled along the pulmonary vessels. In such a case, evidence of artificial inflation must be produced.

2. *Consistence.* From respiration, the lungs, from being compact, become looser and expanded. These are circumstances to be determined by the touch and sight, and result from the mechanical distension by the air. There are three sources enumerated besides natural breathing, from which the air found in the lungs may be derived, namely, artificial inflation, putrefaction, and emphysema. The two latter are not, with relation to the consistence of the lungs, entitled to any attention, as they are nowhere asserted to produce effects which could be confounded with those derived from the distension of the air-cells by atmospheric air. To distinguish insufflation from natural breathing, regard must be had to the weight and colour of the lungs; but a general presumption only can be drawn from the consistence of the lungs. If they are soft, and have a regularly vesicular appearance, inspiration must have taken place; and it will remain to be decided, whether this has been naturally or artificially accomplished.

3. *Specific Gravity.* It was known to Galen that the foetal lung sank in water, and that after respiration it floated; and this it is which constitutes the hydrostatic test. ¹ Bartholin, in 1663,

¹ Daniel, p. 94. *Commentatio de Umbilico et Pulmonibus.*

spoke of the different specific gravity of the lungs before and after birth, as known to all anatomists ; and Swammerdam, in 1667, asserted that the lungs would float, if only one inspiration had taken place ; and in this assertion, he has been followed by Haller, Daniel, and Dr W. Hunter.

Subsequent experience, however, has shown that the specific gravity of the lungs, before and after birth, does not observe an uniform ratio. It has been abundantly ascertained, 1. That children may live some time without respiration ; 2. That after respiration has been carried on for some time, the lungs are not uniformly dilated, and oftentimes to so trifling an extent only, that they sink in water, or occasionally that the lobes are unequally dilated ; and, 3. That in some still-born children the specific gravity of the lungs is less than that of water ; and this may arise from breathing before complete birth, from artificial inflation, or extrication of air through other causes.

It is a fact familiarly known to all obstetrical practitioners, that children occasionally do not breathe till they have been born for some time ; and on the knowledge of this fact rests the practice of persevering in the attempts to animate children so circumstanced. ¹ Bernt, who appears to credit the marvellous relations of Bohn of the

¹ Geschichtliche Uebersicht, p. 12.

resuscitation of children who have actually been interred, has quoted many such instances; and ¹Wrisberg has detailed an interesting account of two examples which he had an opportunity of observing, of children living without breathing, involved in the membranes; the one seven minutes and the other nine. ²Trew quotes Harvey for the following incredible relation:—"fœtum in lucem editum, membranis vero integris, opertum et in aqua sua manentem, per aliquot horas citra, suffocationis periculum, superstitem manere." The destruction of the life of a child so circumstanced, could not be detected.

But the lungs will sometimes sink, although the child have breathed for some time, owing to their imperfect dilatation. ³Craanen was well

¹ Hutchinson, p. 78.

² Dissertatio Epistolica de Differentiis quibusdam inter Hominem natum et nascentem intercedentibus, &c. Nurembergæ, 1736. 4to. p. 85. Not having been able to meet with the edition of Harvey, referred to by Trew, I have not verified this extract.

³ Daniel, p. 100. "Contigit sæpe," inquit Craanen, "(Tr. de homine, p. 253,) ut, quamvis vivus nascitur, statim ejus pulmo aëre totaliter non infletur, sed secundum aliquam ejus partem et quamvis quædam pars, ad quam aer non pertingit, fundum petat in aquam conjecta, non tamen sequitur, infantem esse mortuum in lucem editum: hinc omnes lobi veniunt contrectandi, et *singuli in partes conscindendi*, quæ successive in aquam conjiciantur, et, si omnes fundum petant, judicium est certum,

aware of this, and describes it as a frequent occurrence ; and he had the farther merit of pointing out how the fallacy might be obviated. Heister and Torrez have observed similar instances. But the best case I have met with is the following from Loder :¹ “ Adferebatur scilicet mihi nuper cadaver infantis præmaturi, qui horas tredecim vixerat. Pondere æquabat libras duas, longitudine pollices Parasinos 13. Aperto thorace, animadverti cum nonnullis auditoribus pulmones collapsos, eodemque colore tinctos, quo gaudent in illis infantibus, qui nunquam aërem duxerunt. Exempti pulmones in aqua subsidebant, id quod etiam factum est cum a corde et thymo separati, iidemque in frustula minima dissecti essent ; at aquæ, sale commu-

fœtum in utero mortuum esse ; posset enim fieri, ut infans per momentum respiraverit, et sic omnes lobi non possunt aëre repleti esse, sed aliqua illorum pars, quæ aquæ supernataret interea, dum maxima pars pulmonis fundum peteret, et sic iudex, si vellet a potiori iudicium ferre, falleretur ; hinc medicus, qui sæpe in his casibus advocatur in consilium, sese prudenter gerere debet, et, quamprimum deprehendat aliquam partem pulmonis aëre inflatam et aquæ innatantem, certo pronunciare poterit, fœtum per aliquod momentum aut exiguum temporis spatium extra uterum vixisse et respirasse.” Monet etiam ex anatomicorum suffragio, superiorem lobum dextri pulmonis primo inflari, quò etiam in experimento cum pulmonibus instituto advertere jubet. Et : “ si aliquis lobus,” inquit, “ colorem dilutiorem magis habeat præ aliis, i. e. ad albedinem magis accedentem, hoc est indicium magnum et certum aërem ejus spatia occupare.”

¹ Daniel, p. 169.

ni saturatæ, innatabant. In causam vero inquirens, cur hujus infantis, qui, testibus pluribus, vocem ediderat, 13 horas vixerat, et placida denique morte occubuerat, pulmones aquæ limpidæ non innatarent, nullam earum causarum, quarum antea mentio facta est, inveni. Pulmones enim nec sanguine, nec muco, nec materia tophacea, repleti erant, nullumque in iis scirrhorum vestigium apparebat. Pergens in dissecando cadaver, reperi foramen cordis ovale hians et apertum, viam per ductum arteriosum Botalli valde liberam, et ductum venosum in abdomine pervium.” Bernt¹ alludes to several authors who have seen such cases, and states that he himself has met with them; and, indeed, there are some related in his own experiments. That this is a state of lungs met with chiefly in premature children, a review of the cases on record would distinctly show, and Haller² who was aware of the fact, attributed it to weakness. Schenk³ and Bernt, however, have each related an instance of a child born at the full time, whose lungs sank. In the case of Schenk, the child had lived *four days*, and was strong: in that of Bernt, the child had lived one day, but some degree of dilatation had taken place in each. So far as regards children born at the full period,

¹ Geschichtliche Uebersicht, p. 20.

² Elem. Physiologiæ, tom. iii. lib. 8. sect. 4.

³ Geschichtliche Uebersicht, p. 23.

the test of Craanen would give an accurate result. But in premature, or perhaps in very feeble children, the hydrostatic test would prove inadequate. How far the contraction of the ductus arteriosus Botalli would afford grounds for the correction of the result in the latter cases, may be gathered from the details under that head of the inquiry. The case of Loder, just quoted, may appear to afford a negative answer, but it can scarcely be supposed that the observation of Loder was directed to the circumstance in question with sufficient accuracy. And, to this doubtful case, the whole weight of Professor Bernt's experiments is opposed.¹

The diseased conditions of the lungs may also prevent their floating after respiration ; but unless they are very thoroughly diseased, some portions of them will float after natural or artificial inflation; and an extreme degree of disease could not escape notice. Alberti, in 1728, had noticed this source of fallacy, and mentioned that it might occur in children who had lived for months. He does not appear to have been aware of the proceeding recommended by Craanen to remove the objection. Haller, Büttner, and Meckel, considered a diseased condition of the lungs to such an extent as to prevent the floating of the fragments of the lungs, as exceedingly rare, and the latter has quoted seve-

¹ Bernt's *Geschichtliche Uebersicht*, p. 25.

ral authorities to show, that they do not sink in those who have died from suffocation. That they do sink from suffocation occasionally, is, however, sufficiently established by Hoffmann, Bohn, and Hutchinson. These contradictory testimonies are very probably to be reconciled by the slow or sudden mode of suffocation. It is well known, however, that the blood may be pressed out, and that the lungs will afterwards float. And the same thing occurs in apoplexy of the lungs, or in recent hepatization. The observations of Alberti probably apply to instances of this latter kind.

The objections to the inference, that if the lungs float, the child has lived, are drawn, 1st, from the fact that it may breathe before delivery, so as to cause them to float, and afterwards die previous to expulsion; and, 2dly, that they may have been rendered specifically lighter by artificial inflation, by putrefaction, or by what M. Chausier has denominated—a kind of emphysema.

The possibility of uterine respiration was denied by all writers, down to the time of Bohn. He first maintained, in 1700, that in difficult labours, a child may draw in air enough to suffice for the distension and floating of the lungs, and then die before delivery. Alberti and Trichmeyer concurred in this opinion, but they do not present any examples of such an occurrence. Camper, whose obstetric practice had been very great,

never observed an instance of crying before birth, and Schmidt, on that ground, deemed it a very unfrequent occurrence. The latter in his own practice had, however, witnessed eight instances, where cries were uttered by the child after the head alone was expelled;¹ and he had seen two others, where the children had been delivered by the feet, in whom the lungs floated, though neither emphysematous nor putrid. Roederer, Meckel, and Osiander, admit the possibility of respiration in the latter mode ; and Ploucquet and Haller, though sceptical, do not deny it. The most remarkable case, alluded to by Bernt,² is the one related by Bredenoll, in Siebold's *Journal für Geburtshülfe, u. s. w.* Band 1. It was a case of twins ; the first child had been delivered by the forceps, and the membranes ruptured, and the hand introduced to turn the second, whom he heard distinctly to cry for at least a dozen of times. In the experiments of Professor Bernt himself, are cases which are explicable, on no other supposition than that of uterine inspiration ; but it may be remarked, that the evidence for uterine respiration, is either founded on reasoning, or, as in the case of Bredenoll,³ has occurred only where manual assistance has been requisite. The evidence

¹ Vide Capuron, pp. 405, 407.

² *Geschichtliche Uebersicht*, p. 42.

³ Vide reference to Ficker in *Geschichtl. Uebersicht*, p. 41.

for vaginal respiration is too conclusive to be questioned. Professor Marc has, indeed, employed himself to prove that it is impossible ; but his reasonings must yield to the unquestionable testimony of Schmidt, Osiander, Capuron, and others. In relation to infanticide, it has, however, been usual to disregard the *vagitus vaginalis*, as occurring only under circumstances which could not involve the decision in doubt—either because it was only heard after the expulsion of the head, when there was comparatively but little difficulty on the part of the mother, and as little danger to the child in the accomplishment of the complete expulsion,—or, that it occurred in presentations of the feet, which could not be completed without foreign manual assistance, and therefore could not occur in medico-legal practice.

In footling presentations, it does not appear to me that foreign assistance is indispensable to the completion of the delivery. Indeed I have known repeated instances where expulsion has been effected by the natural efforts alone ; and assuming the admitted fact, that the uterus, after it has expelled part of the *fœtus*, frequently relaxes in its efforts ; and assuming also, on the evidence of Schmidt, Capuron, and others, that inspiration does occur in presentations of the feet before the expulsion of the head, it can scarcely be doubted, that the remission of the pains may continue so

long as to deprive the child of life after some feeble inspirations, but inspirations sufficient to cause the lungs to float. But the possibility of the occurrence of respiration after the expulsion of the head, and death before complete delivery, has been established by Dr Hosack.¹ In his case, the child's head had been born for some minutes, and it had cried, but before the delivery of the body (which was retained, says Dr Hosack, by one of the shoulders being "wedged" above the pubes) could be completed, the child died. Notwithstanding the difficulty which delayed the completion of the labour in this instance, it is perfectly possible that it might have been accomplished by the natural efforts. In two instances, I have myself observed the child to utter distinctly audible sounds in face presentations, before the expulsion of the head; and M. Leroux,² of great experience, thinks it very credible. The difficulty of accomplishing the delivery of the head in such a presentation, is matter of common observation, and a considerable interval of time occasionally elapses before it can be effected. This delay may be fatal to the child. And if death occurred after inspiration, and before complete delivery, I am not aware of any means by which it could be accurately determined

¹ Beck's Medical Jurisprudence, by Dunlop, p. 164.

² Lecieux, p. 39. In the cases of face presentation observed by M. Capuron, he has not known the child to inspire.

whether the respiration had taken place before or subsequent to delivery. In the two instances just adverted to, the delivery was accomplished by the natural efforts, and the children were born alive. Baudelocque¹ says, that in this presentation the delivery is sometimes effected naturally, and sometimes not. The danger to the life of the child has appeared to me to be greatest in presentation of the feet, when delay occurs ; and when apparent death takes place under such circumstances, it is scarcely possible to resuscitate the child.

The certainty of detection in instances of difficult presentation has, I apprehend, been too strongly insisted on. General considerations would appear, indeed, to lead to the opposite conclusion. For the most part, infanticide is committed by females at the first parturition, and numerous instances have occurred, in which the perpetrator of the crime has not even been suspected. And this has occurred in moderately populated districts, where almost every person lay open to observation, and where, on the discovery of such a crime, the most suspicious vigilance has been exercised, in order to ascertain the perpetrator. It is obvious that the guilty person, who, under ordinary circumstances, would have yielded to the delicacy of her situation, has, by a mental effort, either

¹ Heath's Translation, vol. ii. p. 224.

felt or feigned herself free from the usual conditions of her state. And the same mental feeling, during the pains of parturition, would sustain her under severe and protracted suffering, and enable her to avoid detection. The influence of education in repressing the violent expression of a female's suffering during parturition, is sufficiently conspicuous ; and in instances of illegitimate birth, I have had an opportunity of observing decisive proofs of the sense of shame operating powerfully in producing the silent endurance of suffering. It would be easy to illustrate this view of the subject, from the history of sufferings silently borne through religious faith, affection, or pride. Nor can it be doubted that the energetic feelings of a woman, wrought up to the resolved perpetration of infanticide, would enable her to endure sufferings in parturition, to which, under circumstances not implicating her honour, she would succumb. These considerations induce me to conclude, that difficulties which are sometimes supposed to demand foreign manual aid, will be generally surmounted in concealed delivery by the natural efforts. And indeed, it may here be remarked, that there is no point in obstetrical practice, upon which the testimony of practitioners is found more at variance, than the circumstances which demand the use of forceps, for it is this kind of foreign manual aid that I have more particularly in view.

But a woman may assist herself. Foderé¹ has quoted a very instructive example, the investigation of which is an honour to his sagacity and calm judgment; and Günther refers to such instances. The vagitus vaginalis appears then to constitute a possible objection to the determination of the life of the child after birth, by the Docimasia Pulmonum, which must be sometimes insuperable. The readiest objection to oppose to it is the rarity of such a conjunction of circumstances as is indispensable for the occurrence. The appearances on the child's head, or whatever other part may have presented, would afford evidence for or against difficult labour; but it is to the phenomena of injury dependent on the circulation, to which the medical jurist must look for a conclusive solution of his doubts.

The lungs may float from artificial inflation. Bohn,² in 1700, adverted to this source of fallacy, and stated that he knew a case where the lungs of a child had been inflated by blowing air into the mouth, so that they floated. Daniel³ relates that Camper “*observavit in duobus infantibus mortuis natis (quos per aliquot horas in aqua tepida, et dein calida posuit, ut æquarent jam vivos natos, quorumque pulmones erant atro-rubri et*

¹ *Traité de Médecine Légale*, &c. p. 500.

² *Bernt's Geschichtliche Uebersicht*, p. 45.

³ *Commentatio de Umbilico*, &c. p. 163.

subnigri, et particula abscissa submergebatur) inhalato per os admotum aëre : 1. abdomen increvisse ab aëre intestina distendente, ut fæces alvinæ; 2. sanguinem ex umbilico effluxisse magno impetu; 3. pectus dilatatum esse. Pectore aperto, adparebant pulmones coloris rosei, et aëre repleti natabant.” Haller¹ admitted the possibility of inflation so as to make the lungs float, and called it a kind of breathing. Schmidt² has investigated the subject of artificial inflation, and has established the facility with which it may be practised. According to his experiments, crepitation is always present with bloody foam. The distension of the thorax is permanent; the ratio of the weight of the lungs to the rest of the body remaining as in dead-born children. The detection of the source of the air must depend then on the colour and results of the static test, or of Ploucquet’s or Schmidt’s modification of it, and on the new test of Professor Bernt, with regard to the diasteter of the ductus arteriosus Botalli. Another suggestion was proposed by Wildberg, and more lately countenanced by the authority of M. Beclard; namely, that the air introduced by artificial inflation could be entirely expressed. That opinion has, however, been refuted by the experience of Mendel, Bernt, and Mertzdorff; and from their observations, it is

¹ Elem. Physiologiæ, tom. iii. p. 279.

² Neue Versuche und Erfahrungen, u. s. w.

certain that the mechanical effects of inflation on the lungs are similar to those of natural breathing.

Although the developement of air from putrefaction of the lungs, and consequent floating of them, is a source of error of very little practical importance, it has occasioned much controversy. Heister,¹ in 1722, remarked the lungs of a child to float both whole and in pieces, which had obviously died in the womb; and in which the smell of putrefaction, and the loss of the epidermis and other circumstances, rendered it impossible that artificial inflation could have been practised. Haller instituted experiments on this subject. He allowed the lungs of a dead born child to become putrid in water, and saw them float, after seven days, in the same water. The colour was changed from dark to light red, and they were covered with air-bubbles. A dark red, compact-feeling lung out of another body, already powerfully offensive, sank both entire and in pieces. He concluded, therefore, that considerable putrefaction was necessary to cause the floating of the lungs. Camper had previously made the same remark, and had also pointed out the much greater length of time which was requisite for the putrefaction of the lungs in the body, than out of it. Haller suggested, that if the other viscera floated, it might be concluded that

¹ Bernt's *Geschichtliche Uebersicht*, p. 56.

the air in the lungs was developed by putrefaction ; but to this Ploucquet objected, that he had seen both the liver and kidney in the highest state of putrefaction, which did not float. ¹ Jaeger, from experiments and observations on the difference between sound and putrid lungs, came to the following conclusions. A lung which floats from putrefaction, is distinguished from one which does so from breathing, from its situation against the spine, the dark red colour, the air found under the outer membrane in the form of bubbles,² by the easy escape of the air after cutting into the lungs, and the subsequent sinking of them. The air developed by putrefaction, he found to escape with much facility, by means of incisions and gentle pressure, not so in those which had breathed. But he adds what is important, that if the experiment be too long deferred after death, this difference does not continue. ³ Mayer also engaged in an extended series of experiments, during many years, on the putrefaction of the lungs. He found, that on placing the lungs of still-born children in

¹ *Geschichtliche Uebersicht*, p. 61.

² Dr William Hunter, *Med. Obs. & Inq.* 6. 284, has the following remark,—“ If the air-bubbles be large, or if they run in lines along the fissures, between the component lobuli of the lungs, the air is certainly emphysematous, and not air which had been taken in by breathing.”

³ *Schlegel's Collectio Opusculorum*, vol. i.

water, in the course of two or three days their colour changed, and they increased in volume. By the 8th day, at the latest, they floated, both whole and cut into pieces, in the water in which they had become putrid, but transferred to clean water, although they still floated, yet on the slightest compression they sank. The rays of the sun accelerated the putrefaction, but a current of air retarded it, so that they did not float till the 10th or 11th day. After they had once floated, they continued to do so, emitting daily a more offensive odour, and acquiring an increased volume, until the 21st, or at the latest, the 35th day. After that period, they gradually sank down, without a single exception, to the bottom of the vessel; nor did they afterwards in the least float, although kept for seven weeks or even longer. ¹ Dr Beck states, that his own experiments, although not numerous, confirm in every essential point those of Mayer.

Hence, it appears, that, though the lungs may float from a moderate degree of putrefaction, in a more advanced state they have not the same property. This moderate degree does not, however, occur, till the whole body is far advanced in decomposition; and it may be detected, according to Jaeger and Hunter, by the appearance of the

¹ Elements of Medical Jurisprudence, p. 157.

air-bubbles in the surface of the fissures ; by the ease with which, according to Jaeger, Ploucquet, Schmidt, and Marc, the air can be expressed ; and by a mode of discrimination related by Boessel,¹—" in frustula vero dissectorum partes internæ, a vesiculis liberæ, fundum petebant." The experiments above alluded to, render it probable that an advanced state of putrefaction would invalidate the results of an inquiry, notwithstanding the propositions of ² Professor Marc, propositions which do not appear to have been founded on actual experiment, and are directly contradicted by those of Jaeger.

³ Alberti, in 1728, had thrown out a hint that the lungs sometimes contained air which was neither derived from putrefaction nor respiration ; and in 1806, M. Schmidt, in a very distinct statement of the fact, observes that bubbles of air appear in lungs which do not betray the least trace of putrefaction, and that they are thereby rendered capable of floating. He regards this as a true emphysema. His whole relation is a clear anticipation of M. Chaussier on the same fallacy ; but to the latter distinguished author, we are indebted

¹ Daniel. *Commentatio de Umbilico*, &c. p. 120.

² Manuel d'Autopsie Cadaverique, &c. p. 134. Paris, 1808. 8vo.

³ Daniel, p. 117.

for the mode of obviating it. ¹ “ Dans ces cas l'air ou le fluide aëriiforme est contenu dans le tissu lamineux des poulmons, qu'on le fait sortir par la pression, et qu' alors les poulmons projetés dans l'eau se précipitent sur le cliamp, ce qui n'arrive-rait pas si l'air était contenu dans les vésicules bronchiques.”

4. The static test was proposed by the learned Ploucquet, in the year 1777, founded on the relation of the weight of the lungs to the body, before and after breathing. The idea which appeared so happy in theory, was confirmed by experiment in the three instances in which alone Ploucquet had the opportunity of instituting it. And notwithstanding the ample refutation which it had received as a general principle from Chaussier and Schmidt, Dr Smith in England, and Dr Beck in America, are disposed to think that a more extended and accurate examination of the test may establish its utility. Farther consideration will probably satisfy these gentlemen, that the fallacies in the way of this test are of a nature not to be compensated. For the imperfect dilatation of the lungs, as illustrated by the tables of Lecieux, is too frequent an occurrence not to have considerable weight in this question ; and in ²“ many still-born

¹ Lecieux, p. 56.

² Edinburgh Medical and Surgical Journal, 26. 375.

children, the ratio is a lower one than the average for those who have breathed, and *vice versa*."

The proposal of Ploucquet was first opposed by Jaeger, Metzger, and Grüner, by general reasoning. Hartmann¹ made it the subject of experiment in 19 instances, and deduced the ratio as 48 : 1, after respiration, and about 59 : 1, previous to it. Struve stated, that he had found no constant relation under these circumstances ; and his opinion has been confirmed by Chaussier and Schmidt. The latter subsequently proposed to return to the consideration of the absolute weight, as a better means of solving the problem of the previous life of the child. He found, that a mature child had breathed when the lungs weighed 1170 grains. But in 25 mature children, the lungs of four only equalled this weight.² The heaviest lung of the dead-born was about seven grains heavier than the lightest of the living-born. Although the testimony of the absolute weight comes nearer to the solution of the problem than any other form of the static test, it by no means perfectly resolves it ; nor can its employment in juridical cases be of much importance ; 1st, On account of malformations of the lungs, the general structure being unaffected ; 2d, Because the time

¹ Geschichtliche Uebersicht, p. 75.

² In three out of thirty-seven of Professor Bernt's cases, the weight exceeded 1170 grains.

required for the establishment of the pulmonary circulation is not limited to a very short period ; 3d, Because many kinds of death are preceded or accompanied by local congestion ; and, 4th, Because their weight may be increased by other fluids. In the Tables of Lecieux, there are five instances quoted, in which the foetal lungs weighed, 76, 84, 87, 83, and 106 “ grammes ;” and consequently exceeded the weight fixed on by M. Schmidt ; but it is remarked by the learned reviewer of Bernt,¹ that “ it is not quite correct to avail ourselves of Lecieux’s Tables in this way, because the lungs in these cases may have been diseased, a point to which he has rarely attended.” It deserves consideration, however, that these are founded on a far more extensive inquiry than Bernt’s, or even Schmidt’s, for the latter examined only 101 children, whilst Chaussier inspected 400 for this particular object. The ratio of the weight of the lungs to the length of the child, has not been found to be more decisive in its results.²

5. The increased circumference of the lungs, and cavity of the thorax, is another test which was particularly brought into notice by Daniel,³ who proposed to conjoin it with the absolute weight

¹ Edinburgh Medical and Surgical Journal, 26, 375.

² Experimentorum Docimasiam, &c. Prolegomena, p. 5. and Edinburgh Medical and Surgical Journal, 26, 375.

³ Commentatio de Umbilico, &c. p. 200.

of the lungs. He describes an apparatus for the purpose of the experiment of much neatness, but it does not appear to have been introduced into medico-legal practice, for the reasons assigned by Günthler;¹ namely, the delicacy of the experiments, and of the requisite apparatus. It is to be regretted, that these reasons have been held sufficient, for undoubtedly, augmentation of volume and increase of weight constitute a combination which could arise only from the continued acts of respiration and circulation; and Daniel's mode of experimenting appears quite capable of establishing the true state of the lungs in these two respects. The arching of the chest was pointed out by Ploucquet and Metzger, as ground for confident presumption that respiration had occurred; and the latter remarked, that the flatness of the chest was a certain sign that the lungs had not been expanded. In this latter observation, as a sign of extra-uterine life, however, he has overlooked the effect of the postnatal dilatation of the lungs. In the foetal state, the lungs never entirely cover the diaphragm and sides of the pericardium, though they may do so in part, and it has been a mistake not uncommon to say, that they do not fill the cavity of the chest.² That opinion is expressed indeed in

¹ *Geschichtliche Uebersicht*, 83.

² *Foderé*, 4. 503. *Medical and Physical Journal*, vol. vii. Daniel, p. 185.

the last volume of the French Dict. de Médecine, which appeared, so that it may be presumed to be generally received in France. In all the experiments of Professor Bernt, where breathing or artificial inflation had continued for some minutes, the lungs either covered the diaphragm or sides of the pericardium partly or wholly. "A subsidiary test, also depending on their enlargement in volume, and a very excellent one, is taken from the lower margin of the left upper and right middle lobes. These edges are sharp in the foetal state, and are never rounded but by natural breathing or artificial inflation."¹

6. The state of the urinary bladder and intestinal canal cannot be relied on. The discharge of meconium during labour, in breech presentations, is well known, and must be the result of pressure of the womb. Pressure will probably effect its expulsion in a dead child. Mr Abernethy was accustomed to relate in his lectures, the case of a man whose detrusor urinæ was paralysed from injury of the spine consequent on a fall. The nurse emptied this man's bladder when distended by manual pressure over the pubes. The emptying of the foetal bladder would of course happen from pressure. "If, with the signs of respiration, the stomach should contain portions of the fluid

¹ Edinburgh Medical and Surgical Journal, 26, 376.

in which the body has been found, the evidence of life would be unquestionable.”¹

7. The test derived from the state of the foramen ovale is one which has very little evidence to support it. Bernt, in the Preface to the “*Experimentorum Docimasiam*,” &c. has transcribed, from the work of Ridley, the varied conditions of the foramen in the *valvula foraminis ovalis* in *fœtuses* which have not breathed—in those who have breathed for a few moments ; and in those who have lived for several weeks, and in adults. In the first case, the foramen is situated “*ad imam partem valvulæ*.” In the second, when the child has breathed “*per paucula momenta*,” he describes it as “*e tramite suo pristino jam paululum dextrorsum deflexa*.” In those who have lived several weeks, he says, “*adhuc altius cum valvula dextrorsum suspensa deprehenditur*.”² What period of time Ridley comprehended by “*paucula momenta*,” is not more clearly explained, but we may be sure, that in general, the commission of Infanticide takes place in as short a period as possible after expulsion ; for as the object of the crime is the concealment of the perpetrator’s disgrace, it is especially necessary, in order to effect it, that the cries of the victim be stifled without delay. Bernt

¹ Edinburgh Medical and Surgical Journal, 26, 376.

² Vide Trew’s *Dissertatio Epistolica*, &c. p. 31.

professes that his own experiments tend to confirm the conclusion of Ridley. An examination of them will not, however, bear him out in the assertion. In the first section of his experiments, the change of position of the valve is not even noticed ; and in the 26th case,—a still-born child, without any indication of uterine inspiration,—the aperture was turned towards the right side. And such was its position in several other instances. If indeed the changes described by Ridley occurred in so short a space of time as to furnish available evidence of the previous life of the child, since these changes must be dependent on the continuance of the circulation, it is clear that other indications of a far more decisive character would present themselves. It is needless to add, that an open state of the foramen ovale is no evidence that extra-uterine life had not been continued. The following extract from Carcanus,¹ quoted by Trew, presents the most accurate notice of the changes in the vascular mechanism previous to the investigation of Professor Bernt : “ *Animadvertendum est quod non post dies aliquot solum, verum et post aliquot menses, hoc (occlusionem foraminis ovalis atque arteriosi canalis) paulatim a natura esse factum intuitus sum : multoties enim hac de*

¹ *Anatomici libri duo, &c. &c. Auctore J. B. Carcano. Ticini, 1574, p. 12.*

caussa non modo fœtus humanos, verum, quando mihi humanorum facultas non suppetebat, et caninos et bubulos, vitulos nempe (eademque namque est vasorum istorum ratio in brutorum ac in humanis fœtibus) variis ac diversis secui temporibus : aliquos enim *statim ab exortu*, aliquos quatuor dierum, quindecim dierum, alios unius mensis, et duorum mensium, sicut et plurium, multos ego secui. Quod mihi in his videre contigit, hoc fuit. In his non dixerim unius diei vel quindecim vel plurium dierum, verum unius mensis, duorum vel etiam plurium, neque foramen a cava ad venalem pertingens arteriam prorsus et exacte clausum ; neque canalem vidi prorsus assiccatam ; vidi quidem membranam seipsa crassiorem duriolemque factam : vidi etiam eam regionem ea, qua ipsam a foramine dehiscere versus auriculam cordis sinistram, ac in seipsam concidentem, panno lacero convoluto assimilata, dixi, in se contractam adeo, ut pendens in cavitatem venalis arteriæ non amplius panni laceri similitudinem, sua crassitie ac suo foramine præ se ferret. At quod membrana illa prorsus post mensem, duos et plures etiam, foramen occlusisset, nequaquam. Verum aditus quoque et amplus a cava ad venalem arteriam patebat. Quod cum essem intuitus circa membranam foramini præfixam, pari ratione canalem (arteriosum) magna consideratione aggressus sum, ac meatum quidem se ipso angustiolem factum spec-

tavi, verum non adeo clausum, quin et rotunda crassi specilli pars facile huic immitti posset. Quod non modo in vitulis, verum et in bobus, non maturæ ætatis, conspexi. In bobus autem, canibus, et reliquis ætatis perfectæ animalibus, et canalem prorsus occlusam animadverti.”

8. Nor would the changes experienced by the ductus venosus and umbilical vessels after birth afford any satisfactory elucidation in a case of difficulty. The following passage from Trew,¹ illustrative of the changes in the vascular mechanism, founded on his own observations, which were numerous and apparently accurate, will show that there is an irregularity as to time in these processes. “Tempus variat quo plenaria foraminis ovalis, canalisi arteriosi venosique, æque ac vasorum umbilicalium, consolidatio succedit. Meatum vasorum umbilicalium vario tempore claudi exemplis alibi comprobavi. Eodem modo rem procedere in reliquis, non solum Carcanus, verum et alii plures consentiunt. In vitulo quinque hebdomadam canalis arteriosus penitus jam erat clausus, et ex foramine ovali aperturæ capitulo aciculæ vix major tantum restabat. Infans aliquot dierum foramen ovale maxima ex parte clausum exhibebat; dum canalis arteriosus, æque ac venosus, ipsaque vasa

¹ Dissertatio epistolica de Differentiis quibusdam inter Hominem natum et nascendum, &c. Norimbergæ, 1736, p. 95.

umbilicalia, amplissime adhuc patebant; in alio vero duarum hebdomadum vasa umbilicalia maximam partem; canalis vero venosus et arteriosus plenarie erant consolidata, dum foramen ovale multo magis quam in priore, adhuc hiabat." The cases of Professor Bernt present no decisive indications applicable to doubtful cases drawn from an examination of these vessels.

9. The most important suggestion connected with the docimasia sanguinis circuitus, for which we are indebted to Professor Bernt, is that which relates to the contraction of the ductus arteriosus. He has manifestly paid a more minute attention to the changes which occur in it, than any preceding author. Some hint he may perhaps have received from the work of Carcanus, from Olberg,¹ Metzger,² and Mende;³ but nothing more precise than what has been already quoted from Carcanus and Trew, was known previous to the inquiries of Professor Bernt. The following are his conclusions, founded on the experiments detailed in the *Experimentorum Docimasiam*, &c.

He first observes, "Mutationes, quas subit post partum ductus arteriosus communicans—in fœtu (et quidem maturo) dimidium fere pollicem longus,

¹ Geschichtliche Uebersicht, p. 81.

² l. c.

³ Ausführliches Handbuch der gerichtl. Medic. Leipzig, 1822. P. iii. p. 21.

diametrum cum trunco arteriarum pulmonalium parem, figuramque cylindraceam præ se ferens, atque capacitatem arteriarum pulmonalium, crassitudinem caulis pennæ corvinæ æquiparantium, plus duplo superans—nobis occurrebant sequentes.

1. Si paucula momenta recens nati exstiterint, aortam descendente versus sphæroides, (D. A. B.) paulo post mutata figura cylindracea, apparuit conus truncatus, basim cordi, apicem aortæ descendenti, aut contra, obvertens:

2. Si plures horas diemve vitam retinuerint, denuo formam cylindraceam, ast longitudinem et latitudinem imminutam, diametrum caulis pennæ anserinæ, adeoque diametro trunci arteriarum pulmonalium longe minorem, et illi arteriarum¹ binarum pulmonalium fere parem exhibuit:

3. Si vitam ad plures dies septimanamve perduxerint, canalis jam rugosi longitudo ad lineas aliquot, crassities ad diametrum pennæ corvinæ coarctata, diameter vero arteriarum pulmonalium ad crassitudinem caulis pennæ anserinæ aucta conspicitur."

It remains to be ascertained from an examination of the results of his experiments, how far the conclusions are well founded.

The experiments, 76 in number, are valuable, from the care and attention with which they were

¹ The meaning must be, *either* of the principal pulmonary branches.

made, and present a body of evidence on this subject more important than was previously to be found in medical records. I have examined them under several heads.

1. There are nine cases (29, 30, 39, 42, 43, 46, 47, 68, and 70) in which the previous circumstances were either not at all known, or only imperfectly. Although these cases were generally of a tolerably decisive character, yet from the want of information as to the previous circumstances, the conclusions could not be verified; and in the establishment of a new test, I apprehend they should not to be taken into consideration.

2. In thirty-nine of the experiments the children were still born. These were the 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 22, 23, 24, 25, 24 (Sect 2.) 26, 27, 28, 31, 32, 33, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 67, and 75. Twenty-six of these, so far as the relative diameters were examined, which was not the case in all, corresponded with the statement of Bernt, and had no contraction towards the descending aorta. In 7, the ductus arteriosus Botalli was intermediate between the trunk and branches of the pulmonary arteries. In one of these (50th,) there is some evidence for uterine respiration; in the remaining six no satisfactory explanation is discoverable. There are four cases in which the ductus arteriosus Botalli was less than the trunk, and equal to the

branches of the pulmonary artery, and although, in two of these, Bernt says that respiration must have occurred, the evidence is satisfactory only in one. There are, moreover, three cases, the 25th, 49th, (which is also one of the four last alluded to,) and 75th, in which the duct attained the form of a truncated cone. The evidence of uterine respiration is strong in the first; in the second, Bernt draws the same inference, and certainly not without reason; but in the last he acknowledges the difficulties, and this case must remain as an objection, but a solitary and certainly not a decisive one, to that form of the *docimasia sanguinis circuitus*, which is both the most general and the most appreciable.

3. The third series of cases consists of those in which life is said to have continued "*per breve tempus*," or "*paucula momenta*," or where "*paulo postquam respiraverunt, extremum edidere spiritum*," and they tend to show the frequent occurrence of the changes on which the *docimasia sanguinis circuitus* is founded. They are manifestly the cases which, in relation to Infanticide, are of the most importance. They are few in number, the 10th, 14th, 35th, 38th, 60th, and 71st. The four first correspond sufficiently well with Professor Bernt's test of the *ductus arteriosus* becoming sphaeroid towards the descending aorta, and thus representing in figure a truncated cone. No

diminution of diameter is mentioned with regard to the three first ; but in the 38th, the diameter was slightly diminished. In the 60th, the changes were not strongly marked. Neither in the 60th nor 71st, was there any contraction towards the descending aorta. In the 71st, the pulmonary branches were relatively larger in diameter.

4. There are five cases in which life continued for a few hours, (19, 36, 41, 65, 66.) In the three first the ductus arteriosus Botalli was contracted towards the descending aorta ; in the last, the contraction was towards the pulmonary artery. In the 65th, there was neither contraction towards the aorta nor pulmonary artery, but the general diameter of the duct was contracted to that of the pulmonary branches. In two of these examples, (19th and 41st,) artificial inflation was employed. The 36th and 65th were restored to life, “ remediis consuetis.”

5. Of cases in which life continued for one or several days, seventeen are recorded, (12, 13, 15, 16, 17, 18, 20, 21, 34, 37, 40, 44, 45, 69, 72, 73, 74.) This class of cases shows that the contraction of the ductus arteriosus Botalli at its extremity is not regular in its occurrence, and, moreover, that the disappearance of this contraction, and the return to the cylindrical, but *generally contracted* form, do not follow with the regularity ascribed to them by Bernt. For instance, in the

13th and 16th examples, the former of three, the latter of four days continuance, the contraction towards the descending aorta was found, and the same observation is made with respect to the 21st case, which was of ten days' duration; whereas in the 96th, of two days' continuance, there was no contraction at the extremity, but a general diminution of diameter; and I may here repeat, that in the 65th, of two hours' continuance, the same generally diminished diameter and absence of contraction towards the descending aorta or pulmonary artery are noted.

In every instance of natural or artificial respiration, there was either general or partial contraction of the ductus art. Bot. An examination of the 2d series of cases will show, however, that the presence of diminished relative diameter cannot be depended on as an indication of extra-uterine life, because it is sometimes, though not generally, found in still-born children, where no suspicion could exist, that it had been occasioned by uterine respiration or insufflation. Neither is the contraction of the termination of that duct so constant as to be always expected, but whenever it does occur, we are warranted, by a review of the whole evidence of Bernt's cases, to say, that the minor circulation must have been carried on. The 75th case offers the only objection to this conclusion, and that, in my opinion, not decisive, the general

phenomena being explicable solely on the supposition that uterine respiration and the minor circulation had taken place. And I must confess my surprise that in his reasoning on this case, the contraction of the ductus arteriosus B. towards the descending aorta, was not urged by Professor Bernt as an evidence of uterine respiration. In concluding this part of the subject, I may be allowed to repeat, that wherever extra-uterine life has continued for ever so short a time, general or partial contraction of the ductus arteriosus Botalli was found. But as it has been shown by the second series of cases, that the general diminution of diameter, with relation to the trunk of the pulmonary artery, is occasionally found where the minor circulation has not occurred, the possibility must be admitted, that life may have continued without this contraction being dependent on it; and consequently, that although, when the ductus arteriosus Botalli is of equal diameter *throughout* with the pulmonary artery, it may be confidently affirmed, that the minor circulation has not occurred; yet, when the diminution in relative diameter is found, it cannot be safely asserted that the pulmonary circulation has been carried on. But the evidence from the contraction of the termination of the canal appears to me decisive. If such contraction be absent, we cannot correctly say that the child was still-born; but

if it be present, we are bound, according to existing evidence, to entertain the opinion that the pulmonary circulation has been carried on. In what way that circulation has been carried on, forms another question—whether from uterine or vaginal respiration, or from pulsation of the heart during artificial inflation. From what has been said in the previous part of this Essay, it will be seen that I deem it possible, that vaginal respiration may occur in difficult labours, but nevertheless in labours which can be completed by the natural efforts ; in which opinion, I am borne out by the observation of facts, the testimony of Baudelocque,¹ and the authority of Leroux. The comparative rarity of such an occurrence would throw considerable suspicion over the plea, and it would require to be supported by such evidence of severe parturition, as the presenting part of the child will always afford.

III. The period happily is past, when, if the evidence of extra-uterine life was supposed to be established, the guilt of the accused was held to be demonstrated. Infanticide is now a variety of homicide, and if there are instances in which it may not be possible to demonstrate the cause of death, it only participates in the difficulties of homicide generally.

¹ See also Mahon's Médecine Légale, &c. p. 401.

In infanticide, indeed, the victim is less capable of resistance, and therefore detection may be less possible, but the quantity and kind of injury necessary for the destruction of a child, are not often accurately measured by the perpetrators of the crime, and the violence committed is most frequently such, as to leave no doubt as to the cause of death, and constitute at the same time the most unquestionable evidence of extra-uterine life. There are several injuries and criminal sources of death which may be, and have been, practised before the expulsion of the child, and which cannot be discriminated from similar injuries inflicted immediately after birth, but they imply the assistance of accomplices, and a previous meditation on the methods of death, which are uncommon, and they form but a very small proportion of the cases of Infanticide which are subjected to medico-legal examination. By far the most numerous proportion consists of those, in which the injuries inflicted are in a situation, and of a kind, which could not occur during parturition, and attended with phenomena which would not appear, had not the circulation been going on.

The child may die in the womb ; if so, it generally remains from 10 to 20 days, and undergoes putrefaction ; or, according to Chaussier, may be converted into adipocere. Jaeger, of Studtgardt, has well described the appearances of putrefaction

in the womb. He relates¹ that, “ pericranium ossiculis cranii non adhærens, solutum vel consumtum, ossa nuda inter se, vel plane non, vel levissimo in marginibus nexu cohærentia, nimis mobilia et fluctuantia, duram matrem ab iis sejunctam, quin et interdum una cum pia destructam, cerebrum in putrilaginem resolutum.” He adds, that the concurrence of these signs distinguishes it from injury, and everything else.

Capuron, who has given the best summary of the causes of death during parturition, has divided them into innocent and crim^{inal}. Of the former kind are, 1st, Difficult labour, with premature evacuation of the liquor amnii. The effects on the child are such as would result from severe and continued pressure, and the death of the child takes place in the way of apoplexy. The signs which indicate it are bloody and serous tumor of the vertex, occasioned by the contraction of the uterine orifice, deformity and elongation of the head, attended sometimes with fracture of the bones, tearing of the membranes, or separation of the pericranium, and effusion under it,² discoloured

¹ Schlegel, Opusculorum Collectio, 5. 48.

² Foderé remarks, that fluid blood effused at the base of the brain is met with in all children, when the head has been long in the pelvis, and the child has died in that situation. The cerebral ventricles of newly born children, he adds, usually contain much reddish serum, and the brain much blood. Vol. iv. p. 503.

and disfigured visage, congestion of the cephalic vessels, and cerebral effusion. These symptoms are not necessarily fatal. The positions of the injuries of the head, and the absence of any distinct point of impingement from a bruising body—and particularly the negative evidence from the *Docimasia Pulmonum*, would indicate this case.

2. Total or partial separation of the placenta. The death of the child is of course from hæmorrhage, and may be confounded with death from hæmorrhage by the umbilical vessels. In this case, the negative evidence derived from the lungs would be a decisive mode of discrimination.

3. In premature expulsion of the funis, the death of the child is from asphyxia,¹ and could not occasion difficulty.

4. Presentation of the feet; when all but the head is expelled and the delivery tedious. In such circumstances a woman may assist herself; and in so doing, inflict so much injury by her injudicious attempts, as to excite the strongest suspicions against herself. And the more particularly, as this is a conjunction of circumstances under which vaginal respiration may occur. This is a case of much delicacy in the decision. But there are circumstances to lead to its elucidation. Although vaginal respiration is a possible fact, it is not a

¹ Vide *Edinburgh Med. and Surgical Journal*, 19, 461.

common one, and much deliberation should be exercised before admitting it. If a woman had assisted herself, she would not fail to plead the circumstance; and if she did so falsely, it would be proved by the indications which the child would afford of the kind of presentation. The tumour on the vertex would be absent; and an examination into the direction and nature of the injuries would place the subject in a correct light.

5. Retention of the body from mal-position after the expulsion of the head.—Death results from asphyxia; but it is a case of very improbable occurrence in medico-legal practice. Nevertheless the case of Dr Hosack should not be forgotten. Capuron very properly rejects as improbable the strangulation of the child by the os uteri. Such a state I believe to be impossible. After the os uteri has been so dilated as to suffer the passage of the head, it does not contract sufficiently to embrace the neck with any kind of force. Death would result, under such circumstances, from pressure of the cord, if the child had not breathed, and if it had, from the continued impediment to the action of the respiratory muscles. The absence of adequate external injury to occasion death would remove the charge of Infanticide in this case, although, doubtless, a child might be suffocated without leaving any trace of intentional injury.

The only other innocent cause of death deserving of particular attention, is the “entortillement” of the funis around the neck of the child. Death occurs in this way from asphyxia or apoplexy, and if any evidence of injury be left, it is to be found in the spiral, or, where the cord has passed round more than once, in the circular and spiral impression left on the neck. The epidermis is not puckered. Signs of more considerable injury would require strict investigation.—To these causes of death, I may add, that fractures of the bones sometimes occur in the uterus. The most remarkable example has been related by M. Chaussier, in which each of the long bones presented one or more fractures, some of which were recent, others beginning to unite, and others had united.¹

There are criminal causes of death during labour as well as after birth. The former always imply the assistance of an accomplice, and are therefore of comparatively unfrequent occurrence. Of these, the following are the most usual. 1st.² Puncture of the fontanelles or sutures, or between the first vertebra and occiput. 2d. Torsion of the

¹ Bulletin de la Faculté de Médecine, Tom, iii., or Dict. de Médecine, Oeuf Humaine, par C. P. Olivier; also Otto's Handbuch der pathologischen Anatomie, u. s. w. p. 394.

² Belloc has illustrated this cause of death by a clear and judicious report on a case of the kind. Cours de Médecine Légale, 8vo, p. 101.

head. 3d. Detruncation. 4th. Strangling and suffocation. The case related by Foderé of the widow, who pressed the child's head between her thighs till it was dead, is, I presume, a solitary example of the kind. Recently it has been related, by Major Cruise, that in New Zealand, female children are destroyed by pressure on the anterior fontanelle, a mode of death which might be practised before delivery. These causes, with the exception perhaps of suffocation or strangling, in general, so evidently betray the intention with which they were employed, as to leave little chance of error. It is, doubtless, perfectly possible, that a child may be strangled or suffocated before complete respiration, so as to cause its death ; but the nice accomplishment of such a purpose requires a more refined application of injury than is almost ever practised, and, without such caution, the remains of intentional injury would be sufficiently demonstrable. If strangulation were attempted whilst the circulation was going on vigorously between the mother and child, *continued* pressure would be requisite, as death would take place in the way of apoplexy ; and it implies an intermission of uterine pain, which at such a period is not usual. And if it were deferred till the moment of expulsion, an expert accomplice would be indispensable, who, if she possessed art enough to accomplish death in that way, would easily be pre-

pared to effect it in some other, which would defy detection.

Of the natural causes of death after delivery, the following is a general summary. Omission of the usual and necessary attentions ; immaturity, weakness, disease, malformation ; injuries from severe labour, or from sudden expulsion ; sudden expulsion of the placenta, and consequent hæmorrhage ; prevented respiration from the envelopement of the membranes, or suffocation in the discharges.

The two causes last enumerated are not distinguishable from the same causes of death intentionally applied. Of the other, injuries from severe labour, and from sudden expulsion, are most likely to present themselves in considerations connected with Infanticide, and may become the subject of anxious deliberation. With reference to the former, it is essential to bear in mind the injury which the head may undergo, and the morbid conditions which may be found within the cranial cavity, independent of criminal violence ; and what adds to the difficulty of discrimination, is, that whilst injuries from severe labour are not necessarily immediately fatal, they may be of such a kind as to place the life of the child in imminent and momentary danger. Although I have not found such a case on record, I believe it possible that a child, after great injury to the cranium and

its cavity, may be born alive, and die soon after, apoplectic. It must be admitted, however, that a labour of the severity which this implies, could scarcely be a secret one ; and if it were, the child's head would furnish evidence of it, as would probably the pudendum of the mother. The absence of any point of impingement would indicate that pressure, and not blows, had occasioned death.

Injuries arising from sudden expulsion are various, and may occasion difficulty in the decision. They are the less likely to come in the way in Infanticide, from the slower process of parturition in a first labour.¹ But the possibility of the sudden expulsion of a child in a first labour, and under conditions in which it was least to be expected, occurred under my own observation. A respectable married female, more than 40 years of age, became pregnant for the first time. On the day in which she was seized with the pains of parturition, she sent to apprise me that my attendance would be required, and to request me not to be absent from home. In the course of a few hours, I was hastily called to her, and found, on my arrival, that whilst walking along her chamber, the child had escaped from the os externum and fallen

¹ Vide Medical and Physical Journal, vol. vii., for case of sudden delivery, detailed by M. Chamberlayne ; and vol. viii., for another case anonymously reported.

on the floor. The funis was lacerated, but the child had suffered no material injury. It is now living. The mother suffered a good deal of hæmorrhage, but recovered well. That this woman had not been pregnant before, was perfectly satisfactory to me. She was tall, and had a well-formed pelvis, and the child was small, though mature. These last circumstances were favourable to the accident. I am not aware of any case in which the death of the child, or any considerable injury to it, has happened from sudden expulsion, and I must acknowledge that there appears to me to be validity in some of the objections which M. Capuron has suggested to the conclusions drawn by Professor Chaussier from his experiments, as applied to this subject. Capuron's remark on the rugged state of the funis, is contradicted by the case of ¹ Chamberlayne. In the well-known experiments of Chaussier, to determine the degree of injury of the head, arising from falls from a given height, the children suffered no interruption in the fall. Now, in escaping from the uterus, there would be some difference, and a difference affecting the result.

In the first place, the force of uterine action would give it an impulse greater than its own

¹ In Chamberlayne's case, the funis is said to have divided at the proper place, and to have been as smooth as if cut in the usual way.

weight ; but in opposition to that, it must receive a check from the funis, and it is hardly conceivable, that its fall should not be more or less interrupted by the thighs of the mother, either in changing the direction of the fall or diminishing the impetus, and in either case lessening the degree of injury. The possibility of suffocation in privies from sudden expulsion is not disputed ; but I have seen no such case on record. Hutchinson says, that such instances are reported, but he has not more particularly referred to them. It might have happened in the cases already alluded to in the Medical and Physical Journal ; the one mentioned by Dr W. Hunter, and in that which I have related.

The criminal causes of death after delivery are divided into those by omission, and those by commission.

Of the former kind are, the neglect of removing the child from under the bed-clothes, or from the state of supination ; the want of suitable warmth ; neglect of nourishment ; and the neglect of the ligature of the umbilical cord. Foderé¹ remarks, that frequent instances of death from the first of these causes have occurred, but there are no medical grounds for determining whether this has been done designedly, or that the mother was not able

¹ Médecine Légale, 4, 505.

to prevent it. The case mentioned by Dr W. Hunter shows how readily death may occur ; and as illustrative of the facility with which a helpless individual may be suffocated, I may mention a case alluded to by Professor Christison in his Lectures, of a man who was said to have been suffocated when in a state of intoxication, by the water contained in a horse's foot-mark.

Death from want of suitable warmth, which is almost always conjoined with public exposure, is proved by the evidence of respiration and circulation ; by the sanguineous congestion of the large vessels, and by the comparative absence of blood in the superficial ones ; by the position of the body ; and, perhaps, best of all, by the sugillations which may be expected to be met with, more or less, in the depending parts of the body.

Neglect of nourishment is generally combined with exposure, in which case death must be attributed to the combined causes. From neglect of nourishment alone, death could with difficulty be distinguished, because to establish that, it would be necessary to prove how long the child had lived. From the results of Professor Bernt's inquiry, it does not appear that there are any means of determining this with the requisite accuracy.

The neglect of the ligature of the umbilical cord may be accidental or intentional. Its absence is unfavourable to the accused, and the

more particularly if the funis be cut. The effects of the absence of the ligature of the umbilical cord have been a fruitful source of controversy, and men¹ of equal learning, judgment, and experience, have ranged themselves on opposite sides in it. Capuron² has reasoned much to prove that no positive conclusion can be formed respecting it, and adds, from his own experience, that repeatedly in vigorous plethoric children he has divided the funis, and deferred the application of the ligature for some time. The hæmorrhage has spontaneously subsided. The same has happened in feeble children. And he concludes by saying, that he should regard the hæmorrhage, which had caused death after birth, as the effect, not of the omission of the ligature, but of the obstacles which had impeded or *suppressed* the respiration and pulmonary circulation. The case of Foderé furnishes a complete refutation of Capuron's assertion (p. 368,³) that the blood never flows abundantly when the respiration is free.⁴ I may remark that I have

¹ Commentatio de Infantum nuper natorum Umbilico et Pulmonibus. Auctore G. F. Daniel, Hallæ, 1780, 12mo; and Bulletin de la Société Médicale d'Emulation, 1809; and Manuel d'Autopsie Cadaverique, traduit par C. C. H. Marc. p. 99.

² La Médecine Légale relative à l'Art des Accouchemens, p. 364.

³ Vol. iv. p. 516.

⁴ Hutchinson (p. 86.) has a case in point also, but there is an expression in the relation of it, as to the separation of the funis, not very comprehensible.

seen some instances in which, after the respiration was perfectly established, the ligature has slipped off the funis. The pallor and faintness of the children called attention to the cord; and in each instance much blood had been lost. Capuron has referred to the exemption of animals from hæmorrhage; but it may be replied, that the funis is left long, and is torn or bitten through by them, circumstances which are calculated to prevent hæmorrhage. Moreover, if the statements of Brendel may be confided in, there is an anatomical cause for the absence of hæmorrhage in animals. “*In brutorum maturis foetibus,*” says he, “*tum caninis, tum vaccinis, sæpe observavi arteriarum umbilicalium, ad cotyledones sive placentas divaricantium, valde angustos esse ramos ad angulos, et in ipsis arteriarum truncis singulares rugas et plicas esse, quasi obturationis cujusdam initia, atque hæc itidem in ipsa arteriarum umbilicalium origine jam conspicitur. Est et harum arteriarum alia prorsus ad iliacas internas proportio, suntque pro ratione multo angustiores quam humanæ.*”¹ If, then, a child were found with the umbilical cord untied—with distinct evidence of bloodlessness—with proofs that respiration and the minor circulation had been carried on, and without any other apparent cause

¹ *Medicina Legalis.* Auctore J. G. Brendelio, &c. 4to. Hanoveræ, 1789. p. 19.

of death—the inevitable conclusion would be, that it had died of umbilical hæmorrhage. But Röederer has remarked, that the ligature may be applied to the cord after fatal hæmorrhage, for the purpose of deception. If, however, the inspector can collect from two to three ounces of blood, the child could not have died from hæmorrhage. In the case of Foderé, before alluded to, he could not collect two ounces. Heister says, that the blood, as in adults, collects in the *venæ cavæ*.¹

I now pass to the consideration of the causes of death after delivery by commission; and it is commonly in this manner that Infanticide is perpetrated in this country. They may be as various as those of homicide generally, but there are some which are more easily or more frequently employed than others. The following enumeration embraces the more usual and important varieties:—Premature tying of the umbilical cord. Suffocation from division of the *frænum linguæ*, and turning back of the tongue. Stoppage of the aerial passages. Asphyxia by strangulation, or deleterious gases,² or by plunging in privies.

¹ Does it do so before respiration is established? Some of Dr Carson's experiments would lead us to expect that it would not.

² Orfila says, by the snuff of a candle; and Zacchæus relates that one of the Popes was destroyed in this way. MS. Notes of Professor Christison's Lectures.

Wounds and bruises about the head, or in different parts of the body. Crushing of the head. Detruncation, &c. To which may also be added some of those causes quoted under the criminal means of death during delivery; and puncture in the region of the heart, and per rectum. I shall make a few remarks on some of them.

The first-named cause is incapable of detection. The second would easily be recognised by examination. By an inexperienced or incautious person, some of the consequences of natural injury about the head might readily be mistaken for criminal violence. Criminal injuries to the skull are distinguishable by the fracture of one or more bones in situations, which, neither in the course of natural parturition, nor in the case of sudden expulsion, were liable to them. Ecchymoses and wounds would most probably be found accompanying them. In injuries of the bones of the head from violent compression criminally applied, it would appear almost impossible that the marks should very closely resemble those which sometimes, though very unfrequently, occur during labour. Thus the unusual situation, severity, and complication of the injuries, coupled with the general indications of life, would dissipate all doubt as to their origin. Dr Smith has indeed expressed doubts whether fractures of the skull ever take place in natural labour; and if he had satisfactori-

ly established his objections, the decisions of the medical jurist, in instances of this kind, would have been much facilitated. The experience of Chaussier, however, establishes the fact too certainly. In his memoir, "*Sur l'Ecchymose*,"¹ &c. he remarks, that when the superior aperture of the pelvis is narrowed by the projection of the promontory of the sacrum, if the pains are violent and long continued, the head is elongated and deformed, the sanguineous tumour (at the vertex) becomes considerable, the membranes at the sutures torn at some points, blood is effused in the ventricles and on the membranes, and sometimes, he adds, there is a fracture of the bone through its whole thickness, and the fragments are more or less separated, or sunk into the brain, and commonly the child dies during labour, or shortly after. Injuries of this kind, Chaussier remarks, which are always mortal in an adult, are not necessarily so in newborn children, examples of which he has reported in the *Séances Publiques de la Maternité*, in 1807 and 1810.

The effects of injuries about the neck demand the strictest scrutiny, for death by strangulation is perhaps the most common of all causes of Infanticide by commission. The fallacies by which it is beset are the entortillement of the umbilical cord; the supposed injury by the os uteri

¹ *Recueil de Mémoires*, p. 436.

and vagina ; the assistance which a woman would naturally render herself ; the possibility of post mortem injury, and livor, or spontaneous sugillation.

The “entortillement” of the umbilical cord requires that the funis should be of a certain length;¹ and the mark which it leaves cannot be circular, unless it have made a second turn about the neck. According to ² Ploucquet, strangulation by the funis, by the os uteri, or vagina, is not attended with excoriation, a test, however, of no great advantage, for it is very doubtful whether ³ excoriation be present in the execution of criminals by hanging, or in criminal strangulation generally. Professor Christison thus describes the marks left by the rope after the execution of the woman Mackinnon :—“⁴ Slight indentation about a third of an inch broad, the colour sienna brown, margins of it of a faint florid colour, and a few transverse lines caused by congestion in the cutaneous veins.” The early removal of the cord is said by Esquirol to prevent any post mortem appearances. ⁴ When

¹ Vide Scott’s Case of Infanticide, with Remarks, No. 88, p. 75. Edinburgh Medical and Surgical Journal.

² Abhandlung über die gewaltsame Todesarten. Tübingen, 1788. p. 378.

³ Vide Chaussier’s Observations on a Report on the death of General Pichegru. Recueil de Mémoires, p. 286. Marc’s Trans. of Rose’s Manuel d’Autopsie Cadaverique, p. 10.

⁴ MS. Notes of Professor Christison’s Lectures.

asphyxia, says Professor Christison, is sudden and very complete, there is no effusion under the skin. After strangulation by the hand, he remarks, cerebral congestion and lividity of the countenance are generally very considerable.

The assistance which a woman had endeavoured to afford herself, would be generally recognisable by the nature, situation, and direction of the marks. Professor Foderé's¹ case, before alluded to, affords an excellent, perhaps extreme, illustration of the kind of injury, in this instance, which one might expect to meet with under such circumstances, and would afford much assistance in the formation of an opinion. In Infanticide, as in Homicide generally, criminal efforts to extinguish life are not nicely calculated, and accordingly injuries of the tracheal cartilages, or of the vertebræ, are sometimes found, or plain impressions of the nails or fingers. In the year 1824, I was consulted in a case of Infanticide, in which the child had been destroyed by strangulation with the fingers. The indentations were distinctly perceptible on each side of the trachea, and the marks of the pressure of the fingers gradually increased in distinctness, from the back of the neck forwards. The cartilages of the trachea were not injured, but on each side of the trachea coagulated blood was

¹ *Traité de Médecine Légale*, &c. 4. 502.

found. The body had subsequently been divided into two parts, immediately below the diaphragm, and, after being enclosed in a brown paper bag, had been put into a pool of water, through which a stream ran. It became a question to determine how long the child had been born, and one which I had much difficulty in answering. The mother was not discovered.

If, as Dr Hunter appeared to think, insufflation might be practised from a malicious motive towards an unfortunate mother, the infliction of injuries after death is equally likely.¹ An injury inflicted immediately after death, would with difficulty be distinguished from one inflicted during life. It is important to recollect that the capillary circulation may continue after the cessation of the heart's action.² Bichat and Wilson Philip³ have both remarked this; but the observation was made on the frog, and the extension of the analogy may require additional evidence. As a proof of the continuance of the vital

¹ Professor Chaussier says, that such injuries have been inflicted. *Recueil de Mémoires*, p. 470.

² This appears to depend on the suddenness with which life is extinguished. In very sudden death, from whatever cause, the vital properties seem to be far more completely extinguished, than in death which takes place more slowly. Thus fluidity of the blood is a result of very sudden death, from any cause, as lightning, diseased heart, strangulation, &c.

³ *Exp. Inquiry*. London, 1817. 8vo. p. 91.

processes after the apparent extinction of life, I may remark that Professor Christison has seen the blood fluid and *coagulable*, in one instance, (disease of the heart,) two hours after death ; and in another, (disease of the ovary,) two hours and a half. With this property of the blood remaining, some appearances resembling those produced by injury during life, might be produced. Nor could medical evidence furnish an accurate means of discrimination. The testimony of Professor Chaussier is to the following effect : If the injuries have been inflicted soon after death, whilst the muscles preserve their contractility, and the blood its fluidity, the solution is difficult. He professes, that in such instances there will neither be tumefaction, nor infiltration into the cellular tissue, or the blood will only form a clot without adhesion to the divided surfaces. *Finally, he trusts to general evidence.*

The occurrence of livor, employing that term to distinguish spontaneous discolorations after death from ecchymoses, or those which are the result of injury, whilst it renders extra-uterine life highly probable, may be mistaken for the consequence of injuries ; and should be carefully, as I presume it may be easily, distinguished from it. Livor is generally found on the back and thighs, or on the parts of the body on which it has remained when

becoming cold. ¹ It is always confined to the skin, and is greatest when the blood retains its fluidity long. Lividities assume varieties of appearance ; but in their cause, they differ essentially from ecchymoses, for they depend solely on congestion of blood in the capillary vessels. Infiltration, or effusion of *blood* into the cellular tissue, never occurs. If it arise from effusion, it is from a bloody serum, and the tint is deepest in the most dependent part. Livor is never accompanied by tumour. Ecchymosis, or sugillation, on the contrary, is clearly distinguished by a true effusion of blood, and hence coagulated, occasionally by ² tumour, and the nature of it is readily demonstrated. Professor Bernt, in his Historical Review, has alluded to ecchymoses as one of the signs of life ; and if they occur in situations which, during parturition, are not accessible to injury, what proof can be more decisive of the continuance of the circulation after birth ? In conclusion, I may observe, that every injury assigned as the cause of death, must be unquestionably able to produce it, and at

¹ Considerations sur L'Ecchymose, &c. par M. Chaussier, in Recueil de Mémoires, p. 385.

² “ Dans les ecchymoses proprement dites, le sang n'est qu'infiltré ; lorsqu'il est rassemblé en foyer, il constitue ce qu'on appelle *thrombus*.” Traité des Maladies de la Peau par P. Rayer. Paris, 1827. Tome 2d. p. 146.

the same time to leave such signs as are distinctly recognizable.

N I proceed now to a very brief and compendious consideration of the second general division of medical evidence in relation to Infanticide, namely, that which is derived from examination of the mother. The questions to be settled are, 1st, as to the proofs of recent delivery ; and, 2dly, as to the period of delivery, in order that, as far as possible, by connecting that period with the evidence derived from the child, the inference may be correctly drawn, that she is, or is not, the mother of it. As a preliminary inquiry, it may be advisable, so far at least as the Medical Evidence can be decisive on the point, to ascertain whether the previous symptoms of pregnancy have existed. Unfortunately, neither singly nor conjointly are any of these decisive. ¹ Belloc indeed professes, that the health is interrupted for eight weeks, and that at the end of the third month there is a sudden recovery. This he pretends to have found diagnostic. He is singular, however, in his assertion. After delivery, the most satisfactory proofs are drawn from the laceration of the fourchette ; gaping of the vagina with tumefaction, and inflammation, and discharge ; gaping of the os uteri ;

¹ Cours de Médecine Légale, p. 61.

enlargement of the uterus, which is felt above the pubes ; discharge of lochia, distinguished by its peculiar smell ; presence of milk in the mammæ ; milk fever ; peculiar acid smell of the perspiration ; a dark colour around the nipple. ¹ Dr Stringham considered this last sign invariable in pregnancy, and says that it does not occur when milk is secreted from any other cause. The belly also is soft, the skin of it lax and traversed with lineæ albicantes. There is a separation of the linea alba, which is most palpable towards the umbilicus. There is weakness, paleness of the countenance, dulness of the eye, sinking and bluishness of the eyelids. Although these signs cannot be trusted to singly, there is no known disease in which they concur ; and it may be added, that in almost every case, they all occur after parturition, and more particularly after a first labour. The possible fallacies are the sudden cessation of dropsy, or the expulsion of hydatids or moles. In the *Foreign Quarterly Journal of Medicine*, a case is related of the sudden disappearance of dropsy, where water was discharged after passing down the Fallopian tubes, and thus occasioning some of the symptoms above enumerated. In *Rust's Magazine*, (vol. 21.) a good case is related of the discharge of a "mole," preceded by all the general symptoms

¹ Beck's Elements of Medical Jurisprudence, p. 95.

of pregnancy, and accompanied by flooding and the usual signs of parturition. The discharge of the menstruous fluid after long retention, might simulate some of the symptoms of recent delivery; but many of them, and those the most decisive, would be absent; whereas, after delivery, and particularly of a first child, almost all would be found to concur.

But the discovery of such a concurrence of symptoms must depend altogether on the period of time, at which the examination is made. In some examinations instituted in France at the end of a month, no evidence could be detected, though the moral circumstances were decisive. It was long since observed by Zacchæus, that the proofs of delivery were uncertain after the 10th day. After the 4th or 5th they become less distinct, gradually diminishing, and at the end of a fortnight are indecisive.

There are several other subjects of investigation connected with Infanticide of an interesting and delicate nature; but the length to which this dissertation has already extended, forbids me to enter upon the discussion of them.

FINIS.

